

What is claimed is:

1. A lens barrel comprising:

an annular ring which is non-rotatable and includes
at least one circumferential guide groove formed on an
5 inner peripheral surface thereof, said circumferential
guide groove being open at an end of said annular ring
via at least one insertable/removable aperture extending
in an optical axis direction;

a first rotatable ring supported inside said annular
10 ring and rotatable about a rotational axis extending in
a direction of said optical axis, said first rotatable
ring including at least one rotation-guiding projection
slidably engaged in said at least one circumferential
guide groove;

15 a second rotatable ring which rotates together with
said first rotatable ring and is capable only of axial
movement relative to said first ring, said second
rotatable ring including at least one engaging projection
slidably engaged in said at least one circumferential
20 guide groove together with said at least one
rotation-guiding projection, wherein said at least one
engaging projection is insertable into and removable from
said at least one circumferential guide groove in said
optical axis direction through said at least one
25 insertable/removable aperture at a first

assembling/disassembling angular position of said first rotatable ring and second rotatable ring; and

a coupling ring which is positioned inside said first rotatable ring and said second rotatable ring to be non-rotatable relative to said annular ring, said first rotatable ring and said second rotatable ring coupled by said coupling ring to be rotatable with respect to said coupling ring , wherein a coupler provided between said coupling ring and said second rotatable ring is configured to be disengaged in said optical axis direction at a second assembling/disassembling angular position of said first rotatable ring and second rotatable ring;

wherein said first assembling/disassembling angular position and said second assembling/disassembling angular position are substantially the same angular position.

2. The lens barrel according to claim 1, further comprising at least one biasing member configured to bias said first rotatable ring and said second rotatable ring in opposite directions away from each other such that said at least one engaging projection and said at least one rotation-guiding projection are pressed against two opposed surfaces in said circumferential guide groove, respectively.

3. The lens barrel according to claim 2, wherein

said biasing member comprises at least one compression coil spring provided between two opposed end surfaces of said first rotatable ring and said second rotatable ring.

4. The lens barrel according to claim 1, wherein
5 said coupler comprises:

at least one circumferential groove formed on one of the inner peripheral surface of said second rotatable ring and the outer peripheral surface of said coupling ring and extends in the circumferential direction;

10 at least one coupling projection located on the other of an inner peripheral surface of said second rotatable ring and an outer peripheral surface of said coupling ring, said coupling projection slidably engageable in said at least one circumferential groove;
15 and

at least one axial direction aperture extending in said optical axis direction configured to communicatively connect said at least one circumferential groove with an end of one of said second
20 rotatable ring and said coupling ring, wherein said coupling projection is insertable into and removable from said at least one circumferential groove in said optical axis direction through said axial direction aperture.

5. The lens barrel according to claim 1, wherein
25 said at least one circumferential guide groove comprises

a plurality of circumferential guide grooves located at different circumferential positions;

wherein said at least one rotation-guiding projection comprises a plurality of rotation-guiding projections located at different circumferential positions;

wherein said at least one engaging projection comprises a plurality of engaging projections located at different circumferential positions; and

wherein said at least one insertable/removable aperture comprises a plurality of insertable/removable apertures formed at different circumferential positions.

6. The lens barrel according to claim 1, wherein said lens barrel serves as a photographing lens barrel, and wherein said at least one circumferential guide groove comprises:

an assembly/disassembly section formed at one of opposite ends of said at least one circumferential guide groove in a generally circumferential direction of said annular ring, said assembly/disassembly section communicatively connecting with said insertable/removable aperture; and

an operating portion which excludes said assembly/disassembly section,

wherein said at least one rotation-guiding

projection and said at least one engaging projection are configured to move in said operating portion of said at least one circumferential guide groove when said lens barrel is in a ready state.

5 7. The lens barrel according to claim 6, further comprising at least one movable lens group configured to move in said optical axis direction when said at least one rotation-guiding projection and at least one said engaging projection move in said operating portion of said
10 at least one circumferential guide groove.

 8. The lens barrel according to claim 7, wherein at least two said movable lens groups move in said optical axis direction while changing a distance therebetween to vary a focal length, when said at least one rotation-
15 guiding projection and said at least one engaging projection move in said operating portion of said at least one circumferential guide groove.

 9. The lens barrel according to claim 1, further comprising a second coupling device located between said
20 coupling ring and said first rotatable ring such that said first rotatable ring is rotatably supported on outer peripheral surface of said coupling ring via said second coupling device,

 wherein said second coupling device is configured
25 to be disengaged in said optical axis direction at an

assembling/disassembling angular position of said first rotatable ring and second rotatable ring, which is different from said first assembling/disassembling angular position and said second assembling/disassembling angular position.

10. The lens barrel according to claim 1, further comprising an advancing/retracting mechanism configured to move said first rotatable ring and said second rotatable ring in said optical axis direction between front and rear movement limits in said optical axis direction relative to said annular ring,

wherein said at least one rotation-guiding projection and said at least one engaging projection are engaged in said at least one circumferential guide groove of said annular ring when said first rotatable ring and said second rotatable ring are moved to one of said front and rear movement limits by said advancing/ retracting mechanism such that said first rotatable ring and said second rotatable ring rotate at an axial fixed position without moving in said optical axis direction, and

wherein said coupling ring linearly moves in said optical axis direction together with said first rotatable ring and said second rotatable ring.

11. The lens barrel according to claim 10, wherein said advancing/retracting mechanism comprises:

a male helicoid located on said outer peripheral surface of said one of said first rotatable ring and said second rotatable ring ; and

a female helicoid located on said inner peripheral surface of said annular ring and configured to engage said male helicoid, wherein said female helicoid and said male helicoid are disengaged from each other when said at least one rotation-guiding projection and said at least one engaging projection are engaged in said at least one circumferential groove.

12. The lens barrel according to claim 11, further comprising at least one non-threaded portion located on said inner peripheral surface, in which said female helicoid is located, of said annular ring in an area thereon,

wherein said at least one non-threaded portion extends generally parallel to threads of said female helicoid, and is communicatively connected with said at least one circumferential guide groove, and

wherein said at least one rotation-guiding projection and said at least one engaging projection are associated with said non-threaded portion when said male helicoid and said female helicoid are engaged with each other.

13. The lens barrel according to claim 12, wherein

said non-threaded portion comprises an open end section located at one end of said non-threaded portion which is opposite to another end thereof that communicatively connects with said at least one circumferential guide
5 groove,

wherein said at least one rotation-guiding projection is engageable in and disengageable from said non-threaded portion through said open end section, and

wherein said female helicoid and said male helicoid
10 are disengaged from each other when said at least one rotation-guiding projection is disengaged from said at least one non-threaded portion through said open end section.

14. The lens barrel according to claim 10, further
15 comprising:

a cam ring positioned inside said coupling ring and supported thereby, wherein said cam ring rotates together with said first rotatable ring and said second rotatable ring while moving in said optical axis direction, when
20 said at least one rotation-guiding projection is disengaged from said at least one circumferential guide groove, and rotates together with said first rotatable ring and said second rotatable ring without moving in said optical axis direction, when said at least one
25 rotation-guiding projection is engaged in said at least

one circumferential guide groove; and

a linearly movable ring configured to be guided linearly in said optical axis direction without rotating via said coupling ring while allowing said cam ring to rotate relative to said linearly movable ring, said linearly movable ring being engaged with said cam ring to be disengageable therefrom in said optical axis direction in a specific angular position of said cam ring,

wherein said specific angular position corresponds to said first assembling/disassembling angular position and said second assembling/disassembling angular position.

15. The lens barrel according to claim 14, wherein said cam ring comprises at least one cam groove located on at least one peripheral surface of said cam ring,

wherein said lens barrel further comprises a driven member positioned inside said coupling ring and configured to be guided linearly in said optical axis direction without rotating via said linearly movable ring, said driven member having at least one cam follower which is engaged in said at least one cam groove of said cam ring,

wherein said at least one cam groove comprises an open end section through which said at least one cam follower can be engaged in and disengaged from said at

least one cam groove, and

wherein said at least one cam follower is positioned in said open end section when said first rotatable ring and said second rotatable ring are positioned in said first assembling/disassembling angular position and said second assembling/disassembling angular position, respectively.

16. The lens barrel according to claim 14, wherein said coupling ring comprises at least one guide slot which radially penetrates through said coupling ring, said at least one guide slot including a circumferential slot portion which extends generally parallel to said at least one circumferential guide groove of said annular ring and a lead slot portion which extends generally parallel to a moving path of said rotation-guiding projection which is disengaged from said circumferential groove;

wherein said second rotatable ring comprises at least one rotation transfer groove formed on said inner peripheral surface of said second rotatable ring to extend generally parallel to said optical axis;

wherein said lens barrel further comprises at least one guide follower which can be detachably attached to an outer peripheral surface of said cam ring, and which is engaged in said at least one rotation transfer groove through said guide slot to be slidably movable in said

at least one rotation transfer groove and said at least one guide slot; and

wherein said cam ring is insertable into and removeable from said coupling ring in said optical axis direction in a state where said at least one guide follower is removed from said cam ring.

17. The lens barrel according to claim 15, further comprising a second driven member having at least one second cam follower,

10 wherein said at least one cam groove of said cam ring comprises at least one outer cam groove and at least one inner cam groove which are located on an outer peripheral surface and an inner peripheral surface of said cam ring, respectively, and

15 wherein said at least one cam follower and said at least one second cam follower are engaged in said at least one outer cam groove and said at least one inner cam groove, respectively.

18. The lens barrel according to claim 17, wherein said at least one inner cam groove of said cam ring comprises a second open end section through which said at least one second cam follower is engageable in and disengageable from said at least one inner cam groove, and

25 wherein said at least one second cam follower is

positioned in said second open end section when said first rotatable ring and said second rotatable ring are positioned in said first assembling/disassembling angular position and said second assembling/disassembling angular position, respectively.

19. The lens barrel according to claim 17, further comprising a second linearly movable ring positioned inside said cam ring, and configured to be guided linearly in said optical axis direction without rotating while allowing said cam ring to rotate relative to said second linearly movable ring, and is engageable with said cam ring and configured to be disengageable therefrom in said optical axis direction in a specific angular position in a direction of rotation of said cam ring,

wherein said second linearly movable ring is guided linearly in said optical axis direction without rotating via said coupling ring, and

wherein said second driven member is guided linearly in said optical axis direction without rotating via said second linearly movable ring.

20. The lens barrel according to claim 17, wherein each of said driven member and said second driven member are configured to support at least one lens group, respectively.